SQP 2.0 | Survey Quality Predictor

The Program

What is SQP?
- A **survey quality prediction system** for questions used in survey research.
- A program available for free at **sqp.upf.edu**
- A **database of questions** with information about their quality.

What can I achieve with SQP?
An indication of the quality of survey questions and suggestions for improving them. The program provides **reliability, validity, and quality coefficients**, with confidence intervals.

What do I have to do?
- Consult the information aldready stored in the SQP database regarding the quality of each question.
  or
- Introduce a new question and **code its characteristics** following the program instructions until you get a prediction for your own question.

How can I use the information from SQP?

1- **To improve questions before data collection**
Example of a suggestion of improvement:

H28 / **TEST28** / *social trust, careful*
ESS Round 1 United Kingdom - English

Request for Answer Text:
Generally speaking, would you say that most people can be trusted, or that you can't be too careful in dealing with people ? Please tick one box.

Answer options:
- You can't be too careful
- Most people can be trusted

Quality Coefficients

Ⓜ MTMM Results (coefficients)

		Prediction	Interquartile range	Standard error	MTMM Estimate	MTMM 95% Confidence Interval
Reliability Coefficient	r	0.801	(0.765, 0.827)	0.113	0.781	(0.722, 0.829)
Validity Coefficient	v	0.907	(0.882, 0.921)	0.149	0.887	(0.809, 0.934)
Quality Coefficient	q	0.726	(0.659, 0.755)	0.103	0.693	(0.584, 0.775)

Potential Improvement to Question Quality
View the potential for improving this question based on this quality prediction by changing individual characteristics.

View Potential Improvements
Number of categories (ncategories)

Choice	Average what if-prediction	
2	0.528	
4	0.551	+ 0.023
5	0.540	+ 0.012
7	0.535	+ 0.007
11	0.562	+ 0.034

SQP suggests to increase the number of answer categories to 11.
This will improve the question quality by 0.034.

2- **To correct for measurement errors**
Example of correcting the correlations using SQP predictions:

H29 / **TEST29** / *social trust, take advantage*
ESS Round 1 United Kingdom - English

Request for Answer Text:
Do you think that most people would try to take advantage of you if they got the chance, or would they try to be fair ? Please tick one box.

Answer options:
- Most people would try to take advantage of me
- Most people would try to be fair

		Prediction
Reliability Coefficient	r	0.803
Validity Coefficient	v	0.910
Quality Coefficient	q	0.731

The **observed correlation** between H28 and H29 is **.45**.
To recover the true correlation we first need to compute:

$$m = \sqrt{(1 - v^2)} \rightarrow \text{For H28: } m = \sqrt{(1 - .9072)} = .42$$
$$\text{For H29: } m = \sqrt{(1 - .9102)} = .41$$

Then, we use equation 2 (cf. next formula) and compute:

$$\rho(f_1, f_2) = (.45 - .801 \times .42 \times .41 \times .803) / (.801 \times .907 \times .803 \times .910) = .64$$
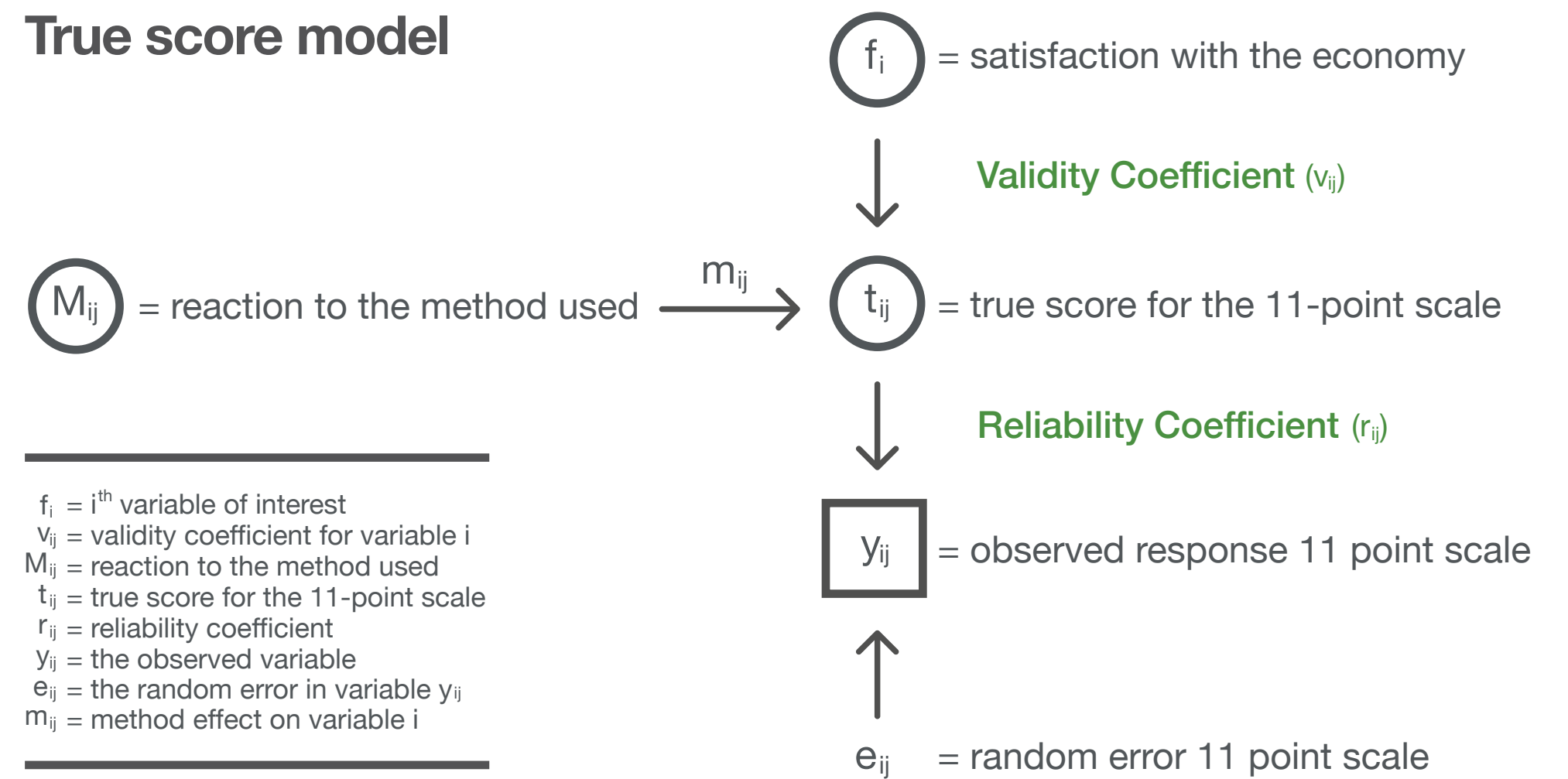
The observed correlation is **underestimated by almost .2**

Example of regression coefficient with and without correction for measurement errors.

Estimates of the parameters	Without correction On Allow immigration		With correction for errors On Allow immigration
By Better Life	-.265*	×2.3	-.609*
By Better threat	-.133*	becomes not significant	.001
By Cultural threat	-.154*		-.140*
Total explained (R²)	.254	×2.1	.547

Behind the program

True score model

f_i = satisfaction with the economy

M_{ij} = reaction to the method used $\xrightarrow{m_{ij}}$ t_{ij} = true score for the 11-point scale

Validity Coefficient (v_{ij})

Reliability Coefficient (r_{ij})

y_{ij} = observed response 11 point scale

e_{ij} = random error 11 point scale

- f_i = i^{th} variable of interest
- v_{ij} = validity coefficient for variable i
- M_{ij} = reaction to the method used
- t_{ij} = true score for the 11-point scale
- r_{ij} = reliability coefficient
- y_{ij} = the observed variable
- e_{ij} = the random error in variable y_{ij}
- m_{ij} = method effect on variable i
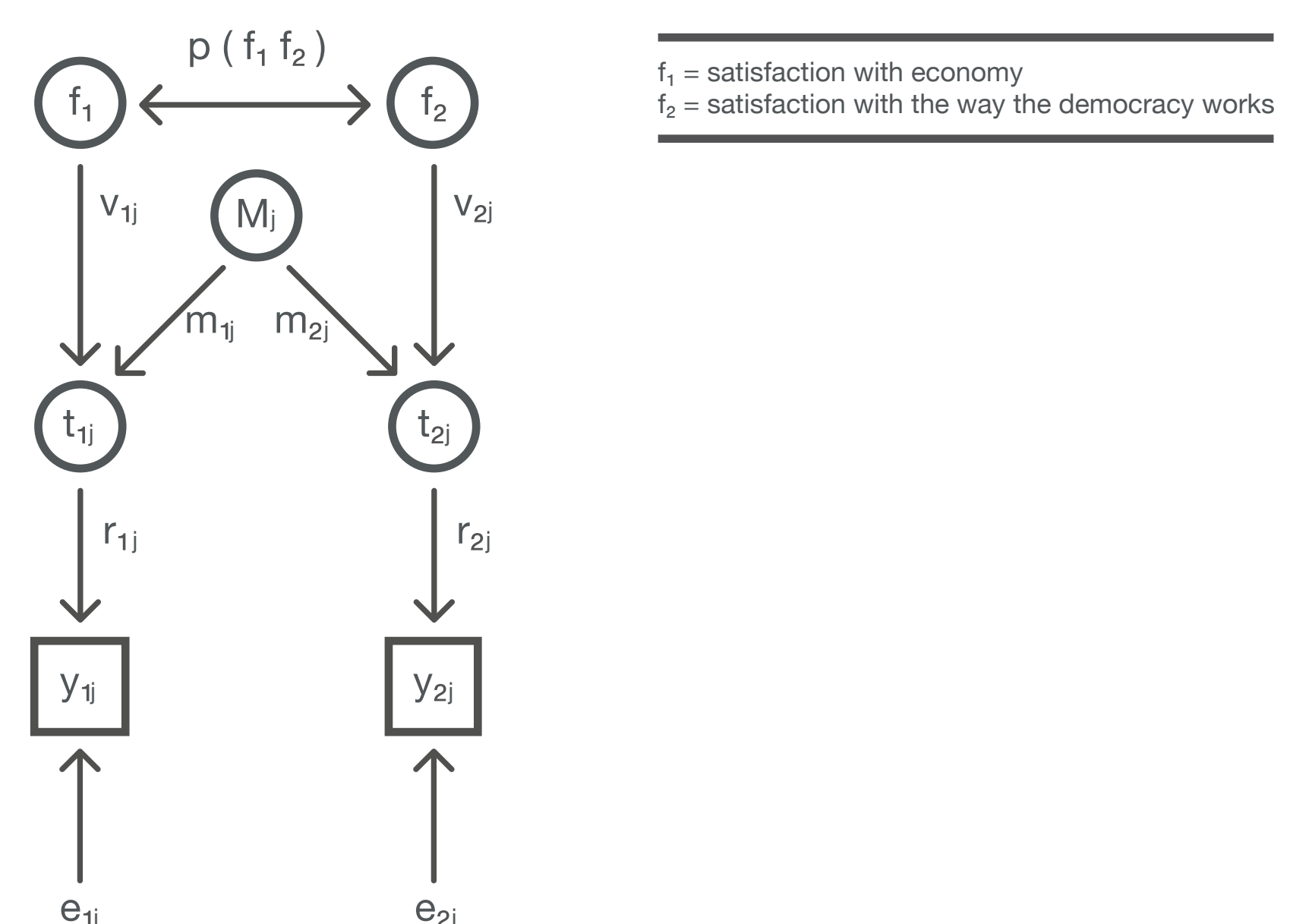
Definitions
Reliability = r^2 = strength of the relationship between t and y = 1 - var(e).
Validity = v^2 = strength of the relationship between t and f = 1 - var(m).
Quality = q^2 = $r^2 v^2$ = variance in the observed variable y explained by f.

If we have 2 concepts

$p (f_1 f_2)$

$f_1 = $ satisfaction with economy
$f_2 = $ satisfaction with the way the democracy works

We can express the observed correlations as a function of the structural parameters:
$$\text{corr}(y_{1j}, y_{2j}) = r_{1j}v_{1j} \, \rho(f_1, f_2)v_{2j}r_{2j} + r_{1j}m_{1j}m_{2j}r_{2j} \qquad (1)$$

We can also reverse the formula to compute the true correlation based on the observed correlation:
$$\rho(f_1, f_2) = [\text{corr}(y_{1j}, y_{2j}) - r_{1j}m_{1j}m_{2j}r_{2j}] / (r_{1j}v_{1j} \, v_{2j}r_{2j}) \qquad (2)$$

In order to recover the true correlation we need estimates of the reliability and the validity coefficients.

Estimating reliability, validity, and quality
- Model not identified for 2 concepts and one method.
- It is identified if we have more concepts (typically 3) measured, each using several methods (typically 3 too).
- This is called the **MultiTrait-MultiMethod (MTMM)** approach.
- Reliability and validity estimated using the True Score model.

Limits of the MTMM approach
- Necessary to repeat the same questions for the same respondents.
- Cannot repeat all questions from all questionnaires in practice.
- High cognitive burden, long questionnaires to avoid memory effects.

Solution: SQP 2.0
- **Meta-analysis** of more than 3,700 MTMM quality estimates explained by up to 73 questions characteristics.
- Random Forest approach used.
- Good predictions obtained: explained variance (R²) for reliability of .65 and for validity of .84.

For more information: sqp.upf.edu or sqp@upf.edu